(12) UK Patent Application (19) GB (11) 2 233 253 (13) A

(43) Date of A publication 09.01.1991

(21) Application No 9012491.8

(22) Date of filing 05.06.1990

(30) Priority data
(31) 8913173 (32) 08.06.1989 (33) GB

(71) Applicant
Pipetex Limited

(Incorporated in the United Kingdom)

Farrington Road, Rossendale Road Industrial Estate, Burnley, Lancashire, BB11 5SW, United Kingdom

(72) Inventors
Francis Lodowic Bartles
Adrian Arthur McNeelance

(74) Agent and/or Address for Service
P R Wharton & Co
Alliance House, 29/31 Kirkgate, Bradford, BD1 1QB, United Kingdom

(51) INT CL[5]
B05D 1/12 1/36, F16L 58/10

(52) UK CL (Edition K)
B2E EFD E1106 E1205 E1212 E1214 E1300 E1311 E1323 E1710 E409S E448T E474U
B2L LCDA
U1S S1573 S1884 S3010

(56) Documents cited
GB 1417123 A GB 1214838 A GB 1073885 A
GB 1059166 A GB 0981626 A GB 0971111 A
GB 0860901 A

(58) Field of search
UK CL (Edition K) B2E
INT CL[5] B05D

(54) **Processes and devices for the protection of pipes**

(57) A process for applying a protective coating to a metal pipe comprising heating a predetermined part of the surface of the pipe, applying a corrosion prevention agent to the heated surface, applying particles of a thermoplastics resin to the heated surface and heating the particles so as to cause them to coalesce. A device for carrying out the process comprising a plurality of curved body members connected hingedly to one another and adapted to encircle the surface of a pipe, the device providing means for applying separately a corrosion preventive agent and a thermoplastics resin and means to heat the particles of resin.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 233 253 A

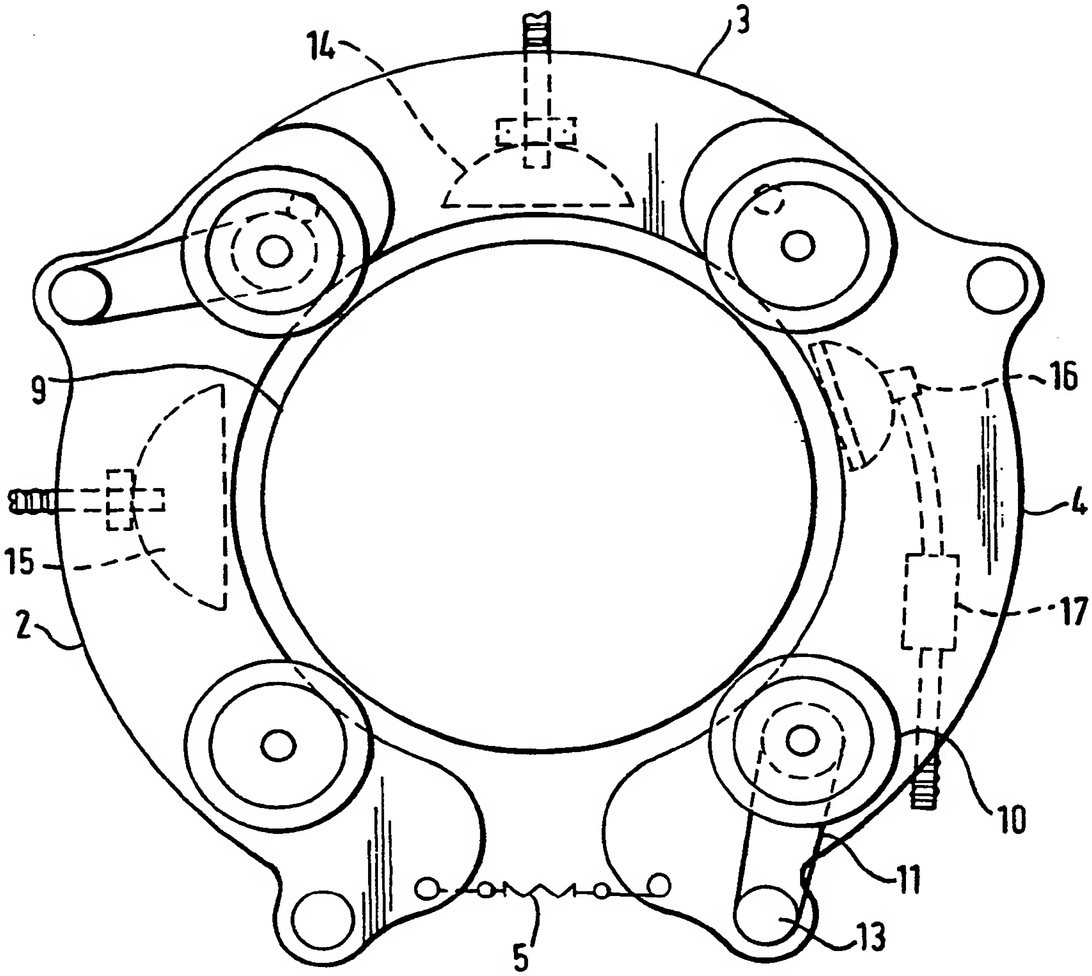

Fig.1.

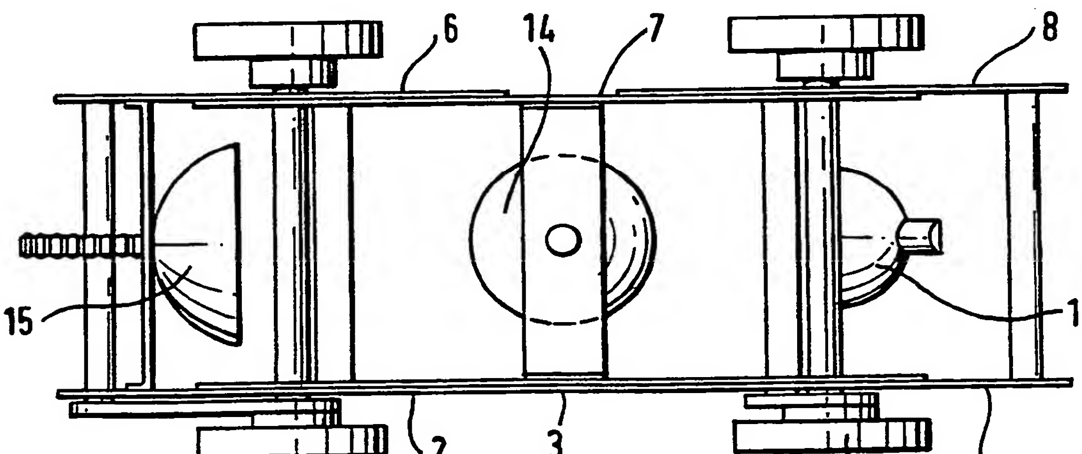

Fig.2.

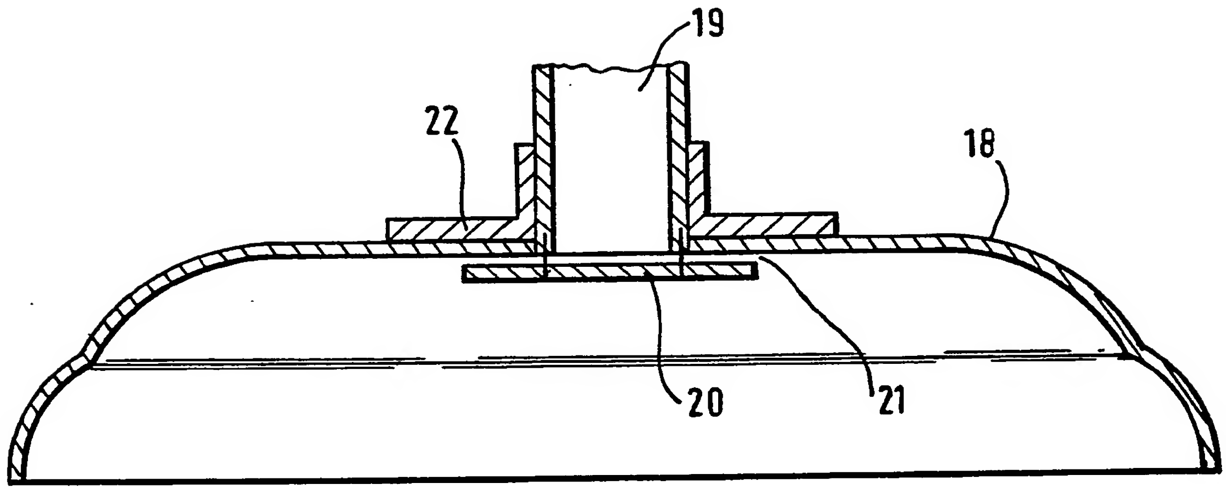

Fig.3.

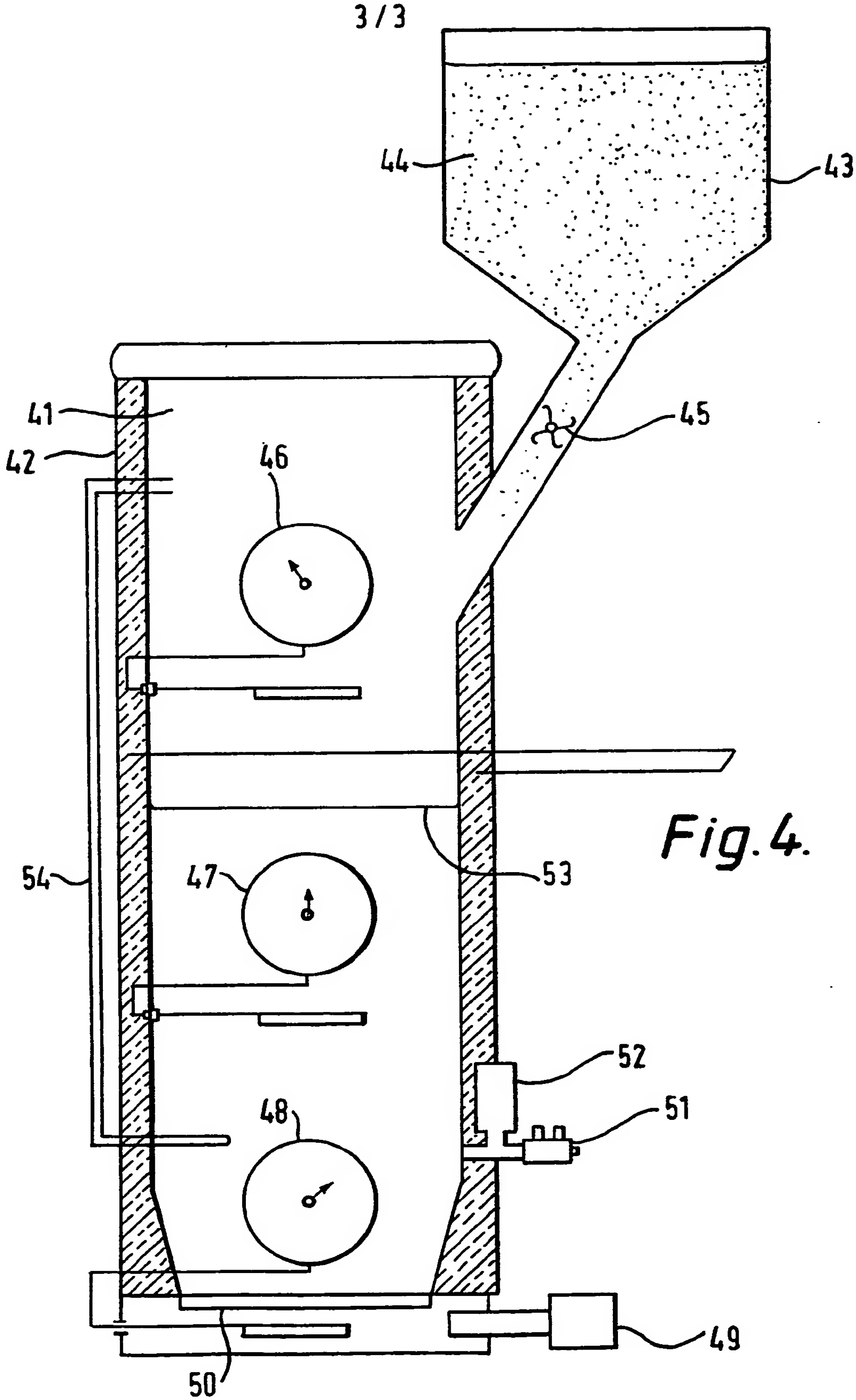

Fig. 4.

Processes and Devices for the Protection of Pipes.

This invention relates to processes and devices for the protection of pipes particularly but not exclusively pipes for use in the distribution of gas and oil.

Pipes for use in the distribution of gas and oil are generally made of steel. Accordingly at least the external surfaces of the pipes are required to be treated to protect them from corrosion and also to provide some degree of thermal insulation. In general individual lengths of pipes are treated under factory conditions and then transported to locations where they are to be joined together, usually by welding, to form a piping system. A major disadavantage of this procedure stems from the fact that during the treatment of the pipes in the factory the ends of the pipes are required to be left untreated so that they can be welded together at their locations. Consequently a length of piping consisting of numbers of individual lengths of pipes will have intermittent areas which are unprotected where the welds are located and these have to be treated. However this operation is often rendered difficult due to the adverse conditions under which the process has to be carried out, eg. on board ship or in remote locations on land or under difficult weather conditions. The difficulties are magnified by the fact that existing processes utilising tape, sleeves which have to be shrunk on to the pipe, application of paint, synthetic plastics materials etc. are difficult to apply correctly under these conditions.

The present invention is directed to processes and devices which can provide effective protection to welded joints in a steel pipeline utilising techniques which are convenient

to carry out and result in the formation of protective coatings which provide a high measure of protection.

Accordingly this invention provides in one aspect a process of applying a protective coating to a metal pipe comprising heating a predetermined part of the surface of pipe, applying a corrosion prevention agent to the heated part of the surface, applying particles of a thermoplastics resin to the heated surface and heating the particles so as to cause them to coalesce.

This invention comprises further a device for carrying into effect the above process comprising a plurality of curved body members connected hingedly to one another and adapted to encircle at least partly and engage with the surface of a pipe, means to move the device round the pipe, means to apply separately a corrosion prevention agent and particles of thermoplastics resin to a predetermined part of the surface of the pipe and means to heat the particles of resin.

The present process can be carried out on pipes having widely different diameters, for example from 5 to 160 cm. However the diameters are generally within the range of 10 to 105cms. The pipes have generally been partly treated with a protective layer by the manufacturers so as to leave the ends of the pipes untreated. The ends of adjacent pipes are then welded together in the usual way and then prepared for application of the process of the invention. The preparation entails thoroughly cleaning and roughening the area of the weld. This can be carried out conveniently by any conventional grit blasting process. Thus the welded area of the pipes can be surrounded by a jacket which can be rotated. The jacket is provided with an inlet terminating in an applicator head from which grit can be

blasted by means of a stream of compressed air on to the welded area. The jacket is provided also with an outlet connected to a source of vacuum which removes the grit once it has performed its function. During the blasting process the jacket is rotated so as to ensure that the whole of the welded area is treated.

The next stage in the process comprises treating the welded area with a corrosion prevention agent. For this purpose any agent generally employed for the prevention of corrosion of iron or steel can be employed for example coal tar enamels and paint. However a material known generally as a fusion bonded epoxy coating compound which is used in the form of solid, initially fusible particles, is preferred. This material provides not only a very hard protective covering for the surface of the pipe but in addition it facilitates the bonding of the outer layer of thermoplastics resin which is nevertheless required in order to impart shock and abrasion resistance to the inner layer of corrosion prevention agent as well as providing an thermal insulant. In order to apply the thermosetting compound the welded area is heated uniformly to a temperature of from 240 to 260 degrees centigrade. Various methods can be employed for example the use of flames. However a more satisfactory method comprises surrounding the area with a number of induction coils disposed axially of the pipe and heating the pipe by induction.

The corrosion prevention agent when in the form of solid fusible particles can be applied preferably utilising the device described below. After application of the agent the hot surface is then treated, preferably with the same device with solid particles of the thermoplastics plastics resin. Various materials can be used however preferred materials comprise polyolefinic resins having particle

sizes varying from 100-450 microns depending upon the particular polyolefin employed. The term" polyolefinic resin" is taken to include polymers of olefins and co-polymers of olefins with other ethylenically unsaturated substances. For example very good results have been obtained from using a resin developed by Dow Chemicals Limited under the name SPOAR. This resin comprises a polyolefin in which a major proportion of the particles are in the range of about 200-450 microns. Another resin which also has been found to give good results is sold under the trade mark POLISIVE by Himont Italia. This material consists of a mixture of particles of polypropylene the major proportion of which have a size falling within the range of 100-225 microns. When the corrosion prevention agent comprises solid particles both the agent and the thermoplastics resin are applied preferably by means of the device shown in Figs 1 to 3. Prior to application the thermoplastics material is preferably fluidised and then applied by means of a stream of compressed air to the welded area which has been treated already with the corrosion prevention agent. The particles are softened by the heated surface on which they have been made to impinge and in the event of the temperature being insufficient to cause the particles to melt and coalesce to form a layer additional heat is applied as a final step in the process. The thermoplastics material can be applied alone or in admixture with other substances not necessarily thermoplastic for example cementitious materials, bitumen and glass fibre.

The process is carried out preferably with the device described below in which;

Figure 1 is an end view of the device.

Figure 2 is a plan view of the device shown in Fig.1

Figure 3 is a view taken in vertical cross section of the feature shown as numeral with a casing wall removed.

Figure 4 is a view taken in vertical cross section of a machine used for delivering heated and fluidized particles of resin to the device described in the above figures.

With reference to Figs.1 to 3 the device shown generally as numeral (1) comprises three curved body members (2, 3 & 4) connected together by hinges. The free ends of members (2 & 4) define jaws which when the device is in use are urged together by spring (5). Members (2, 3 & 4) co-operate with similar members (6, 7 & 8) to form a casing which surrounds the welded area of pipe (9). The casing is provided with four pairs of rubber wheels (10) which engage with the outer surface of the pipe (9). Each pair of wheels is driven by an endless belt (11) powered preferably by a pneumatic motor (13). The numbers of hinged members can be varied and the preferred number depends upon the diameter of pipe which is being treated. For pipes of small diameter ie. of 10 cms or less two hinged members can be sufficient. However for pipes from about 10 to 105 cms three members are preferred whilst five or even larger of members cam be used for pipes having correspondingly larger diameters.

The interior of the casing is provided with a first applicator (14) for application of the corrosion prevention agent. When the agent consists of solid particulate material the applicator communicates with a fluidizer from which it receives the agent in a fluidized condition. The casing incorporates a second applicator (15) for application of the particles of resin and a heater (16) which receives heated air from heater (17). Other forms of heater can, if desired, be used for example infra red or

induction heaters. The second applicator is preferably of the kind illustrated in Fig.3 in which a shield (18) made conveniently of aluminium is provided with an inlet (19) terminating in a baffle (20) defining an orifice (21) between the wall (18) of the shield and the baffle (20). This arrangement ensures that a stream of particles entering the shield impinge on the baffle and as a result the particles become evenly distributed on to the surface of the pipe.

Other forms of applicators can be used, for example a single applicator head which is fitted with appropriate ducting and valves so that a corrosion prevention agent and particles of thermoplastics resin can be discharged alternately from the head.

In use spring (5) is disconnected and the jaws formed by hinged members (2 and 4). These members have free ends which are separated to receive the welded area of pipe (9) which has previously been prepared by grit blasting and then heated. The jaws are then closed and the spring replaced. As a result the four pairs of wheels (10) engage firmly with the pipe. The pneumatic motor (13) is then switched on causing the wheels to rotate the device in a clockwise direction. At the same time a valve (not shown) is opened allowing the corrosion prevention agent to be discharged from applicator (14) on to the welded area. When this stage has been completed two further valves (not shown) are opened allowing the fluidised particles of resin to discharge on to the treated area and to be melted into a continuous layer by hot air discharging from applicator (16). The thickness of the layer of resin can be increased by making the casing either to oscillate backwards and forwards or to rotate continuously round the pipe whilst the supply valve is open until the layer has attained the

required thickness. In the event of resins being employed having a lower melting points the initial heat supplied to the welded area may be sufficient to cause melting of the particles in which case additional heating by means of the hot air applicator may not be necessary.

The thermoplastics material is supplied in the form of particles which are both fluidised and heated. This can be achieved by means of the apparatus illustrated in Fig.4 in which a fluidizer (4) having insulated walls (42) is provided with a hopper (43) filled with the resin (44). The resin is transferred to the fluidizer by means of a rotary valve (45). Three temperature gauges (46, 47 & 48) measure the temperature at different levels within the fluidizer. Hot air is blown by air heater (49) through screen (50) into the fluidizer (41) and mixes with the particles of resin which are discharged from the fluidizer into a venturi pump (51) where they become fluidized. The flow of particles through the venturi is controlled by valve (52). Pressure within the fluidizer above and below the level (53) of resin is controlled by a pressure equalizing conduit (54). The heated and fluidized particles of resin are then conveyed to applicator (55) of the machine shown in Figs.1 to 3.

Claims

1. A process of applying a protective coating to a metal pipe comprising heating a predetermined part of the surface of the pipe, applying a corrosion prevention agent to the heated surface, applying particles of a thermoplastics resin to the heated surface and heating the particles so as to cause them to coalesce.

2. A process according to Claim 1 wherein the corrosion prevention agent is applied as solid fusible particles.

3. A process according to Claim 2 wherein the corrosion prevention agent is applied as solid particles of a thermosetting epoxy resin.

4. A process according to Claim 3 wherein the particles of the epoxy resin are heated to effect partial thermosetting of the resin and treating the partially thermoset resin with particles of a thermoplastics resin and then heating the particles of the thermoplastics resin sufficiently to cause them to coalesce.

5. A process according to any one of the preceding claims wherein the particles of thermoplastics resin comprise a polyolefinic resin.

6. A process according to Claim 5 wherein the particles comprise sizes within the range of 100 to 450 microns.

7. A device 1 for carrying out the process claimed in any one of Claims 2 to 6 comprising a plurality of curved body

members connected hingedly to one another and adapted to encircle at least partly and engage with the surface of the pipe means to move the device round the pipe, the device being provided with applicator means for application separately of a corrosion prevention agent and particles of a thermoplastics resin to a predetermined part of the surface of the pipe, and means to heat the particles of resin .

8. A device according to Claim 7 wherein the applicator means comprises two separate applicators.

9. A device according to either of Claims 7 & 8 wherein the body members are carried by wheels.

10. A device according to Claim 9 wherein the wheels are driven by a pneumatic motor.

11. A device according to any one of Claims 6 to 10 wherein two body members have free ends and the free ends are urged together by a spring.

12. A device according to any one of Claims 8 to 11 wherein either or both the applicators incorporates a baffle against which an incoming stream of particles impinges.

13. A device according to any one of the preceding Claims 8 to 12 wherein one of the applicators communicates with a source of heated and fluidized particles of thermoplastics resin.

14. A device according to any one of Claims 7 to 13

wherein the means to heat the particles of resin comprises an applicator communicating with a source of hot air.

15. Devices for the application of a protective coating to a metal pipe as hereinbefore described with particular reference to the drawings.

BNSDOCID: <GB___ Published 1991 at The Patent Office, State House, 66/71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office.